

Chapter One

General Background

Introduction

The U. S. Army Corps of Engineers (Corps) has prepared this After Action Report (AAR) in response to Libby Dam operations in the spring of 2006, the resulting flows and flood stages in the Kootenai River, and the emergency actions taken by the Corps to protect the local communities in and around the towns of Libby and Troy, Montana, and Bonners Ferry, Idaho.

The AAR¹ provides background information on the Corps' responsibilities for the operation of Libby Dam for multiple objectives and addresses areas impacted in the Kootenai River Basin, including downstream of Libby Dam and the local levee system. The report discusses the conditions and factors considered in real-time decision-making for Libby Dam operations from January to July 2006 as well as describing the emergency actions taken by the Corps in response to the flood event. Also included is a review of communication processes and a summary of the Corps' actions and key lessons learned from the 2006 event.

Chapter One provides background information on the Corps' responsibilities for the operation of Libby Dam for multiple objectives, and addresses areas impacted in the Kootenai River Basin, including Libby Dam and the local levee system.

I. Columbia River Basin Overview

The Columbia River originates in the Canadian Rockies in British Columbia and flows for 1,214 miles through Canada and the United States, eventually emptying into the Pacific Ocean. The Columbia River Basin drains approximately 258,000 square miles. Libby Dam, located in the Columbia River Basin, is one of fourteen federal projects operated by the Corps and Bureau of Reclamation (Reclamation); for purposes of this AAR are referred to as the Federal Columbia River Power System (FCRPS). The FCRPS is operated as a system in an integrated, coordinated manner for congressionally authorized purposes, including flood control, hydropower generation, irrigation, navigation, fish, wildlife, water quality, and municipal and industrial water supply. The Bonneville Power Administration (BPA) is responsible for marketing and transmitting power generated by the FCRPS projects. This system of hydro-projects was developed as a comprehensive regional development plan for the Columbia River Basin as discussed in House Document No. 531. (See Figure 1, below, for map of the Columbia River Basin.)

¹ This report was prepared pursuant to the Corps' Engineer Regulation ER 500-1-1, which requires an AAR for events that involve over \$500,000 in total Flood Control Coastal Emergency expenditures and is conducted at the request of the Corps' Northwestern Division and Seattle District Commanders.



Figure 1. Columbia River Basin

II. Kootenai River Basin Overview

As can be seen in Figure 2, the Kootenai River is a major tributary of the Columbia River, draining an area of 16,180 square miles, including 8,985 square miles above Libby Dam. Its source is high in the Canadian Rockies, and three-fourths of its total drainage lies within British Columbia. The basin above Libby Dam is roughly diamond-shaped, with a 200-mile length and 90-mile maximum width. Major tributaries

in the basin above Libby Dam are the Elk, Bull, White, and St. Marys Rivers in British

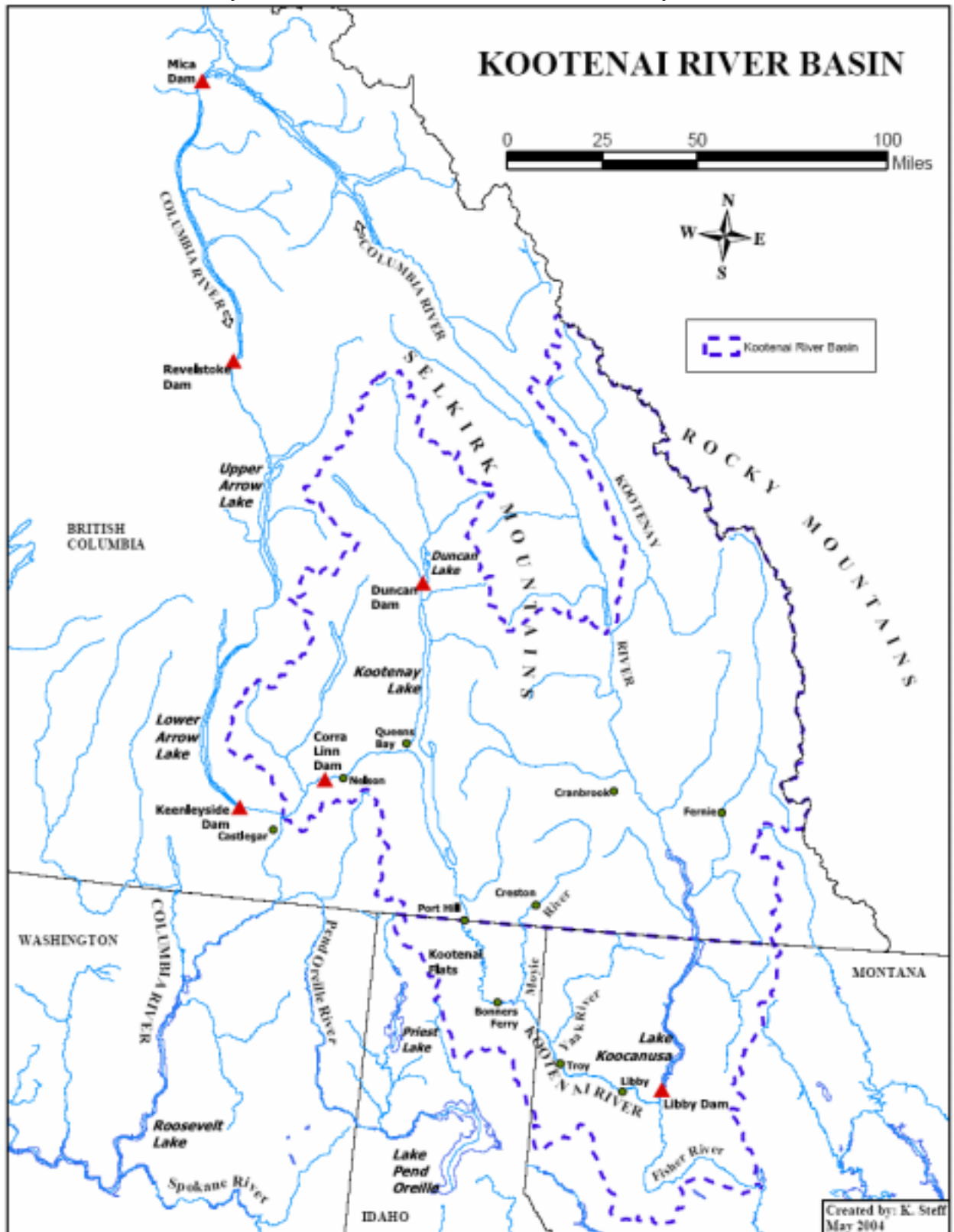


Figure 2. Kootenai River Basin Showing Canadian and U.S. Dams

Columbia, and the Tobacco River in Montana. Downstream from Libby Dam, the Kootenai River flows for approximately 116 miles through Montana and Idaho before flowing back into Canada into Kootenay Lake. After leaving Kootenay Lake, it flows approximately 23.6 miles to its confluence with the Columbia River. The major tributaries between Libby Dam and Kootenay Lake are the Fisher and the Yaak Rivers in Montana and the Moyie River in Idaho. Bonners Ferry, Idaho, approximately 70 miles downstream of the dam, is the control point for local flood control operations at Libby Dam. The towns of Libby and Troy, Montana, are located approximately 18 and 36 miles downstream of the dam, respectively.

III. Libby Dam Overview

The Libby Dam project was authorized by Public Law 516, Flood Control Act of 17 May 1950, 81st Congress, Second Session, substantially in accordance with a plan set forth in House Document 531², 81st Congress, Second Session. The Corps operates Libby Dam for multiple uses, including flood control, hydropower generation, navigation, recreation, fish and wildlife, and in a manner consistent with applicable federal and state statutes, regulations and treaties. Construction of Libby Dam began in 1966, the structure was complete by 1973, and the project became fully operational in March, 1975.

Lake Koocanusa, the reservoir formed by Libby Dam, is approximately 90 miles long and stretches 42 miles into Canada. Normal full pool and minimum regulated reservoir elevations are 2459 and 2287 feet, respectively. At full pool, Lake Koocanusa encompasses 46,456 acres and provides 4.98 million acre-feet of usable storage. Discharges from Libby Dam are usually made through the powerhouse generation facility, which has a capacity of approximately 25,000 cubic feet per second (cfs). The spillway can also be used to release water. (Figure 3 - Libby Dam)

The Corps operates its projects, including Libby Dam in accordance with a variety of statutes, treaties, executive orders, and other guidance. These include the Columbia River Treaty, the International Joint Commission (IJC) 1938 Order on Kootenay Lake, the Endangered Species Act, the Northwest Power Act³, and Libby Dam's enabling legislation. The following sections summarize key elements of these requirements.

² H.D. 531 includes discussion of fish and wildlife concerns in its consideration of development of this regional hydro-system: "I submit for transmission to Congress my [Chief of Engineers] report on a comprehensive plan for development of the Columbia River and its tributaries for flood control, navigation, power development, irrigation and other purposes, including fish and wildlife and recreation." Id. Vol. I at 11. H.D. 531 authorized Libby, Albeni Falls, John Day, and The Dalles dams.

³ The Pacific Northwest Electric Power Planning and Conservation Act of 1980.



Figure 3. Libby Dam

IV. Authorities and Other Responsibilities Concerning the Operation of Libby Dam

A. Columbia River Treaty

The Treaty Between the United States of America and Canada Relating to Cooperative Development of the Water Resources of the Columbia River Basin, commonly referred to as the “Columbia River Treaty,” was signed in 1961 and ratified in 1964. It provides for the addition of reservoir storage for flood control and power production, comprising three dams in Canada and one in the U.S. (Libby). The Corps’ Division Engineer and the Administrator of BPA are designated as the U.S. Entity, and have responsibility for coordinating the planning and operation of the FCRPS projects, including Libby Dam, with BC Hydro designated by Canada as the Canadian Entity. This coordination includes the development of the flood control operating plan (FCOP), assured operating plans, detailed operating plans, and the option for annual arrangements with Canada for mutually beneficial non-power use agreements. The Corps works through the Entities to coordinate operations identified in biological opinions.

In accordance with the Treaty, the Entities executed a subsequent agreement to address operational changes at Libby. This agreement, the Columbia River Treaty Entity Agreement Coordinating the Operation of the Libby Project With the Operation of Hydroelectric plants on the Kootenay River and Elsewhere in Canada, commonly referred to as the “Libby Coordination Agreement,” or the LCA, was executed on February 16, 2000. The LCA sets forth the Entities’ implementing procedures for cooperating on a continuing basis to coordinate the operation of the Libby project with the operation of hydroelectric plants on the Kootenay River and elsewhere in Canada.

The U.S. Entity provides annual updates to the Canadian Entity on the expected operation of Libby Dam, including power generation, flood control, and other non-power requirements, in what is referred to as the Libby Operating Plan (LOP). The LOP is updated annually by August 1, with additional updates provided weekly as appropriate.

During the last year, the Entities continued coordination on specific flood control issues. The Canadian Entity suggested the FCOP be revised to address inconsistencies in language, update flood stage descriptions, and provide more detail on the balance of local versus system flood control. The Canadian Entity also expressed concerns about implementation of VARQ, and requested that implementation be deferred until the Entities had agreed on methods to address power and flood control impacts in Canada. The Corps will continue to consult with the Canadian Entity on these issues.

B. International Joint Commission (IJC) 1938 Order on Kootenay Lake

The operation of Libby Dam is also governed by the 1938 IJC Order on Kootenay Lake, which addresses elevations of Kootenay Lake, located 140 miles downstream from the dam. Releases from Libby Dam cannot exceed the natural inflow to the reservoir behind Libby Dam if the level of Kootenay Lake is above the elevation specified in the Order. This can constrain the operation of Libby Dam, particularly in January through March. The Corps coordinates Libby Dam operations with BC Hydro and Fortis BC to assure compliance with the 1938 IJC Order.

C. Endangered Species Act

The Corps, Reclamation, and BPA (Action Agencies) consult with both the U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS or NOAA Fisheries) to address the effects of the operation of FCRPS projects on ESA listed species and their designated critical habitat. ESA consultations with NOAA Fisheries address the effects of the operation of the FCRPS projects on listed salmon and steelhead, while the ESA consultations with the USFWS address the effects of the FCRPS projects on Kootenai River white sturgeon, bull trout, bald eagles, grizzly bears, gray wolves, Canada lynx, and Ute ladies' tresses.

1. ESA Consultation with NOAA Fisheries on the FCRPS

For listed anadromous species (salmon and steelhead), the most recent ESA biological opinion (BiOp) was prepared in response to the District Court remand order dated June 2, 2003.⁴ In its 2005 Record of Consultation and Statement of Decision (ROCASOD), the Corps provided the basis for the decision to implement actions identified in the Final Updated Proposed Action⁵ (UPA) and considered in the NOAA

⁴ Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin (Revised and reissued pursuant to court order, *NWF v. NMFS*, Civ. No. CV 01-640-RE (D. Oregon)).

⁵ For the remand, the Action Agencies and NOAA Fisheries agreed that the actions to be analyzed for the new BiOp would be based upon the same actions called for in the 2000 BiOp's Reasonable and Prudent

Fisheries BiOp (2004 NOAA Fisheries BiOp) issued on November 30, 2004. For Libby Dam, those actions include implementing VARQ, variable end-of -December flood control, improved forecasting procedures, refilling the reservoir by approximately June 30 each year, and drafting to meet salmon flow objectives during July and August, with draft limits of elevation 2439 feet (20 feet below full pool) by the end of August.

On May 26, 2005, the District Court found the 2004 NOAA Fisheries BiOp legally invalid and remanded to NMFS to address the Court's Opinions and Orders issued on May 7, 2003, and May 26, 2005. During this remand period, NOAA Fisheries, the Corps, BPA, and Reclamation are collaborating with sovereign entities, the four northwest states and several Native American Indian tribes, to develop a new proposed action, which will include actions at Libby Dam, and a revised jeopardy analysis that will result in a legally valid BiOp.

2. ESA Consultation with USFWS on the FCRPS and Libby Dam

The USFWS issued a Biological Opinion and Reasonable and Prudent Alternative (RPA) on December 20, 2000 concerning the Effects to Listed Species from the Operations of the Federal Columbia River System. The 2000 USFWS BiOp included actions and operations for Libby Dam. With the USFWS designation of 11.2 miles of the Kootenai River in Boundary County, Idaho as sturgeon critical habitat on September 6, 2001 (66 FR 46548), the Corps and BPA requested reinitiation of consultation on the effects of Libby Dam operations on listed sturgeon, bull trout and designated sturgeon critical habitat. A Supplemental Biological Assessment (Supplemental BA) for Libby Dam operations was submitted to the USFWS on July 7, 2004.

On February 8, 2006, the USFWS issued an interim rule (71 FR 6383), to be effective March 10, 2006, adding 6.9 miles of critical habitat for sturgeon extending upstream of Bonners Ferry through the "braided reach" of the Kootenai River. ESA consultation was concluded with the issuance of the Fish and Wildlife Service Biological Opinion regarding The Effects of Libby Dam Operations on the Kootenai River White Sturgeon Bull Trout and Kootenai Sturgeon Critical Habitat (1-9-01-F-0279R), dated February 18, 2006 (2006 BiOp). The operation of the remainder of the Corps' FCRPS projects addressed in the 2000 USFWS BiOp will continue as described in the Corps' May 15, 2001 ROCASOD.

The 2006 USFWS Libby BiOp included a RPA that adopts a performance-based approach to achieving habitat attributes (water depth, velocity, temperature, and rocky substrate) for the Kootenai River white sturgeon. In addition, the RPA provides for long-term implementation of VARQ, development of a flow plan implementation protocol, minimum flows for bull trout, and specified ramping rates.

Alternative (RPA), which NMFS concluded would avoid jeopardy to the listed salmon and steelhead. The Action Agencies updated the RPA actions and prepared the Final Updated Proposed Action (UPA), and submitted to NOAA Fisheries on November 24, 2004.

3. Annual Water Management Planning and Coordination

The Action Agencies coordinate the operation of the FCRPS projects for sturgeon, bull trout, salmon and steelhead through the Regional Forum Technical Management Team (TMT)⁶. This technical group provides in-season recommendations to the Federal dam operators on real-time operations to meet BiOp objectives for listed fish. The Corps' in-season decisions during the migration and fish passage season are made after considering TMT recommendations. The TMT meets throughout the year to monitor, evaluate, and make recommendations on shaping available water based on real-time water conditions and biological information, and on other system operational matters affecting fish. In coordination with NOAA Fisheries and USFWS, the Corps may adopt alternative operations as required for flood damage reduction, research, emergencies, navigation, or to meet other requirements.

D. The Pacific Northwest Electric Power Planning and Conservation Act

The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act) established the Northwest Power Planning Council (Council). The Council is directed to develop a program to protect, mitigate and enhance fish and wildlife of the Columbia River Basin affected by the development and operation of the basin's hydroelectric facilities, while also assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply. The Act also directs the Council to inform the public about fish, wildlife and energy issues and to involve the public in its decisionmaking.

The Corps is required to exercise its responsibilities for operating the FCRPS in a manner that provides equitable treatment for fish and wildlife with other purposes for which the Corps facilities are operated and managed. Pursuant to the Northwest Power Act, the Corps takes into consideration the Council's Fish and Wildlife Program and Mainstem Amendments to the fullest extent practicable. See <http://www.nwcouncil.org/fw/program/mainstem/Default.htm>

The Mainstem Amendments recommend that Libby Dam operations in summer consist of stable or flat flows extending into September, with a 10 foot draft limit in most years. This operation differs from the current operation, which provides for a 20 foot draft limit by August 31st as addressed in the NOAA Fisheries 2004 BiOp and the USFWS 2006 BiOp. The current summer flow augmentation operation of Libby Dam and other FCRPS operations for listed anadromous species are under discussion in the court ordered collaborative remand process described above.

⁶ The Regional Forum was established in the NMFS 1995 FCRPS BiOp and is comprised of sovereigns representatives invited from Northwest States, Native American Indian Tribes and federal agencies to make recommendations concerning BiOp objectives. The TMT is a technical team that is tasked with making recommendations on real-time operations to meet the BiOp objectives.

V. Flood Control Operations

A. System-wide Flood Control

The Corps is authorized to direct flood control operations for all federal and non-federal storage projects, including Canadian projects, in the Columbia River Basin. The Columbia River's annual runoff is nearly 200 million acre-feet (MAF), measured at the mouth of the Columbia. There is slightly more than a total of 46 MAF of storage space available in the entire Columbia River Basin, including all federal, Canadian, and non-federal storage and run-of-river projects that have minimal storage capacity.⁷ There is a total of 37.2 MAF in the projects relied on most often for storage – the federal and Canadian projects and Brownlee reservoir, which is owned and operated by Idaho Power Company.

Prior to ESA listings of several fish species in the Columbia River Basin, the FCRPS reservoirs drafted from October through March, the coldest months when the demand for power is highest. These projects would also fluctuate outflow on a daily and hourly basis to meet peak power demands throughout the year, an operation referred to as “load following.” From April through June, the output from the headwater storage projects (Libby, Hungry Horse, and Dworshak) was reduced to near minimum outflow to refill for the summer recreation season. The reservoirs then remained as full as possible during the summer recreation season, drafting five or ten feet at most. In the fall, the storage projects were again drafted to provide for flood control and power.

With the ESA consultations and BiOps described above, an additional objective for storage projects has been to operate such that the reservoirs are as full as possible, i.e. at the upper flood control elevation, by April 10, in order to have water available for flows for fish in the spring and to assure refill for salmon flow augmentation in the summer. The upper flood control elevations are represented by the Storage Reservation Diagrams (SRD) developed for the Columbia Basin storage reservoirs. The SRDs were developed with the objective of providing flood protection for the Portland - Vancouver area as well as local areas just downstream of individual dams. Once the summer drafts are completed, the fall operation objective is to provide for resident fish releases while still achieving the December flood control elevation.

B. VARQ Flood Control Operations

Prior to the changes to flood control operations as a result of ESA consultations, the Corps operated Libby Dam using Standard Flood Control (Standard FC). Under Standard FC, the dams would generally draft deeply during the January through April period to provide water storage for flood control. Then during refill, dam discharges would be held at minimum flows. With the objective of better assuring reservoir refill while providing fish flows as recommended in both the USFWS and NOAA Fisheries BiOps, the Corps developed variable discharge (or VARQ) flood control. In the development of VARQ Flood Control, the Corps coordinated with the State of Montana,

⁷ Columbia River Treaty Flood Control Operating Plan, May 2003, Table 1.

which had developed Integrated Rule Curves (IRCs).⁸ VARQ Flood Control is intended to improve the multi-purpose operation of Libby Dam while not reducing the level of flood protection in the Columbia River Basin.

Under the VARQ Flood Control Operating Procedure, the pool elevation at Libby is held higher than under the standard flood control procedure, given a certain range of “normal” snow pack conditions. The VARQ procedures identify sufficient discharges from Libby Dam during refill in the spring to accommodate the remaining runoff in the snow pack. The positive net result is an increased probability of Lake Koocanusa refill, thus providing higher flows for sturgeon through the spring freshet while better assuring more water for flow augmentation for salmon and steelhead in the Columbia River in the summer months. In addition to operating for system flood control under the VARQ or Standard FC procedure, the Corps operates Libby, to the extent practicable, not to exceed the 1764 feet Bonners Ferry flood stage elevation designated by the National Weather Service.

On December 31, 2002, the Northwestern Division Commander signed a Finding implementing VARQ at Libby Dam on an interim basis until the EIS process for long-term implementation was completed.⁹ This Finding was based on the “VARQ Upper Columbia River Alternative Flood Control and Fish Operations Interim Implementation Northwestern Division, U.S. Army Corps of Engineers Decision Document,” dated December 2002. The Decision Document incorporates the Environmental Assessment and Finding of No Significant Impact (FONSI). The EA and FONSI are online at http://www.nws.usace.army.mil/ers/Doc_Table.cfm?status=1 (Project - Upper Columbia Alternative Flood Control and Fish Operations). See Appendix L for detailed description of VARQ and history of its development.

VI. Levees Flood Damage Reduction System – Non-Federal Levees

Flood damage reduction in the Kootenai Valley consists of Libby Dam and a system of non-federal levees which extend from Bonners Ferry to the Canadian border. There are approximately 100 miles of non-federal levees along both banks of the river in the Kootenai Flats area, which are divided into 16 drainage districts. USFWS also maintains a levee system in the Kootenai Flats area to protect a wildlife preserve area. The Corps has no current authority to maintain these levees; however, the Corps remains prepared to offer support in the form of technical advice regarding local efforts to maintain the levees.

A. Historical Background Concerning the Condition of the Non-Federal Levees

Prior to the construction of Libby Dam, levees were built and maintained by local drainage districts to protect the City of Bonners Ferry and agricultural land within the

⁸ The flood control component of IRCs is similar to VARQ flood control.

⁹ The Upper Columbia River Alternative flood Control EIS was under development to assess the long-term implementation for VARQ.

Kootenai Flats area. These levees were constructed using river silts and sands and in some cases armored with gravels, cobbles, or angular rock. They were constructed on top of natural river banks which are higher than the adjacent agricultural lands. As a consequence, the local drainage districts use a system of drainage canals and pumping stations to augment the levee system.

Between 1948 and 2006, the Corps assisted local levee sponsors with flood response and repairs to the levees under Public Law 84-99 authority. Public Law 84-99 allows the Corps to engage in flood response, advance measures, and repair and rehabilitation of flood control works threatened or damaged by floods. In the late 1960's, the drainage districts upgraded their non-federal levees based, in part, on Corps' recommendations on height, prism cross-section, and erosion protection.

Prior to 1987, the Corps' program included inspection of completed PL 84-99 rehabilitation projects in the Kootenai Flats area to assure that local sponsors maintained the structure in accordance with the terms of their Project Cooperation Agreement. In 1987 a change in Corps' policy for implementing the PL 84-99 levee inspection program limited inspections to only those non-federal levees for which local sponsors formally requested inclusion into the PL 84-99 program. After receiving such a request, the Corps performs an initial levee evaluation and determination of eligibility. Once a levee is considered eligible for the Corps' levee rehabilitation program, the Corps can assist locals with flood damage repairs to the levees. Boundary County, the Drainage Districts, and the City of Bonners Ferry chose not to request inclusion in the non-federal levee program before 2006. Because of this, the Corps did not conduct PL 84-99 evaluations of these levees before the 2006 flood event.

In 1996, the Corps advised Boundary County that the local levees had seriously deteriorated from erosion and that they no longer provided reliable protection for river stages of 1770 feet as measured at Bonners Ferry.¹⁰ The condition of the levees posed a potential threat to the local community should a major flood occur in the region, since effective flood damage reduction in the area is dependent upon both the presence of Libby Dam and the condition of the local levees. Many of the levee systems had riverward toe and slope erosion that made the levees susceptible to failure during high water events. Because the levee embankments generally consist of fine grained silts, once the erosion protection was lost, the levees could fail very quickly. The loss of riverward toes and slopes also increased the risk of rotational and drawdown failures of the levees.

In 1999, Boundary County, through their Congressional delegation, formally requested that the Corps investigate the status of the Kootenai River levee systems. In 2001 the Corps completed the General Investigation 905(b) Reconnaissance Study (GI Study) to determine the potential for Federal flood reduction projects. The study identified 16.3 miles of Kootenai River levee erosion damage with an estimated repair cost of over \$23 million. The study recommended that: (1) further federal/local cost-

¹⁰ In a letter dated September 27, 1996, Col. Wynn, District Engineer, Seattle District, sent a letter to the Boundary County Commissioners indicating concern about the local levee deterioration and the need for rehabilitation.

share studies should be deferred until a later date, (2) further analysis into seepage impacts in the Upper Columbia Alternative Flood Control (“VAR Q”) and Fish Operations EIS (“UCEIS”) should occur, and (3) Boundary County should formally request that the levees of concern be inspected by the Corps for possible inclusion in the Corps’ P.L. 84- 99 levee rehabilitation program.

B. Pre-Flood Levee Condition

Based on the studies described above, it appears that there was a history of significant river bank and levee erosion in specific locations throughout the levee system. In addition, in 2004, the Corps inspected levees to estimate probable failure points (PFPs) and associated river stages as part of the Bonners Ferry Flood Level Study. PFPs ranged from elevation stages 1762’ to 1776’ at the Bonners Ferry gage. Also, the Bonners Ferry Flood Level Study, conducted in response to the 2000 USFWS BiOp RPA, further examined weaknesses in the local levee system.

It appears that the rate and extent of erosion had decreased with the cessation of daily load following operation at Libby Dam in 2001 as recommended in the 2000 USFWS BiOp RPA. The Corps has found that a majority of the river banks show signs of improvement due to the re-establishment of vegetative growth on the previously eroded slopes. The most recent erosion study in 2004 noted that there has been little increase in the amount of erosion since 2001.

C. Kootenai River Flood Stage at Bonners Ferry

The National Weather Service is responsible for setting flood stage. This stage is usually set at river levels where the community may be affected by over-bank flooding. In 1996, the flood stage on the Kootenai River at Bonners Ferry was set at elevation 1764 feet, and since then the Corps has operated Libby Dam so as to avoid voluntarily exceed this flood stage, to the extent practicable.

Additionally, when the Kootenai River stage at Bonners Ferry remains at or above elevation 1758’ for an extended period, high groundwater, also referred to as seepage, inundates or saturates fields in the valley bottom, damaging crops, making fieldwork difficult, and increasing pumping requirements. The National Weather Service issues river statements to the public with forecasts of water levels of 1757’ or higher. This helps the drainage districts determine their pumping requirements.

In 2001, Boundary County officials met with representatives from the Corps, National Weather Service, USFWS, the State of Idaho, and the Kootenai Tribe, to discuss lowering the flood stage to approximately 1761 feet as measured at Bonners Ferry. The Weather Service decided not to lower the flood stage at that time, but remained interested in reviewing impacts attributable to a flood situation with the next occurrence, and revisiting the flood stage designation at that time.

The Corps is currently compiling data on the flood threat and over-bank flooding associated with the 2006 spring flood event. This data will be provided to the National Weather Service to assist in reviewing the Kootenai River flood stage at Bonners Ferry.